Control of Honey Mesquite by Shredding and Spraying

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Highlight: *Simultaneous shredding and spraying of honey mesquite were studied in the Rolling Plains of Texas. Mature trees were shredded and sprayed monthly, May, 1972, through October, 1972 (September was omitted). Herbicide treatments consisted of 2,4,5-T amine, 2,4,5-T ester, and Tordon 225 Mixture applied alone and in combination with naphthalene acetic acid (1, 5, 10, 50, and 10,000 ppm). Very high percentage root mortality was obtained when the trees were shredded and sprayed in May, with somewhat lower percentages obtained from treatments applied in June and October. Root mortality obtained from treatments applied in July and August was generally lower than that obtained from treatments applied during any other month. However, results from treatments applied any month of the study exceeded the results one could expect from either shredding or spraying applied alone during a comparable period. Tordon 225 Mixture was consistently most effective in controlling shredded mesquite. Therefore, shredding accompanied by a simultaneous herbicide application has potential in control programs.*

Conventional methods (such as aerial spraying, rootplowing, chaining, etc.) of controlling honey mesquite (*Prosopis glandulosa* var. *glandulosa*) are often impractical because of small acreages involved or proximity to susceptible cultivated crops. In such areas, shredding mesquite has received considerable attention, especially in the Rolling and High Plains of Texas (Fisher et al., 1959; Schuster, 1968; Herndon, 1970). Although shredding was effective for temporary control of honey mesquite, it must be repeated every year or two (Fisher et al., 1959; Rechenthin et al., 1964).

Most often shredding produces a pruning effect which causes sprouts to grow at a faster rate than growth prior to shredding (Carpenter, 1970). Weddle and Wright (1970) reported no root mortality of honey mesquite from shredding alone. Ames (1966) used various chemical and mechanical methods to control mesquite, but found that all methods required periodic maintenance treatments. Follow-up treatments involving a herbicide for controlling 2- and 3-year-old mesquite resprouts were largely ineffective (Karr, 1971). However, addition of thiamine (3.4 ppm), niacin (1.6 ppm), biotin (2.4 ppm), or pyridoxin (2.1 ppm) to 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) significantly enhanced the control of 1- and 2-year-old mesquite resprouts (Sosebee, 1974). Naphthalene acetic acid (NAA) added to 2,4,5-T and picloram increased control of trunk sprouting of nine tree and shrub species in California (Harris et al., 1971). Generally, shredding without a follow-up treatment has neither been popular nor recommended.

Because shredding alone kills few trees and requires some type of follow-up treatment, an effective herbicide applied simultaneously with shredding could increase root mortality and reduce the number of maintenance treatments necessary for control. This study was designed to measure the effectiveness of honey mesquite control with shredding accompanied by a simultaneous herbicide application.

Experimental Procedures

Shredding and spraying honey mesquite simultaneously were studied on the Bethel Ranch located 7 miles south of Quanah, Tex., in the Rolling Plains. The site was transitional between deep hardland and shallow clay characterized by clay to clay loam soils of the Tillman-Vernon series (Lofton et al., 1972). The soil is deep to shallow with a clay loam surface layer. It is slowly to moderately permeable in the lower layers. The topography is nearly level to gently sloping. Vegetation on the site was predominantly honey mesquite and tobosa grass (*Hilaria mutica*).

Trees (8 to 10 ft tall) were shredded monthly May 15 through October 15, 1972 (September was omitted) with a 65-hp farm type tractor and a 7-ft rotary shredder. Each herbicide treatment was randomly applied to the stumps of 15 mesquite trees (replications) immediately after shredding.

Herbicide treatments consisted of 2,4,5-T trimethylamine salt (Veon 245[1]), 2,4,5-T propylene glycol butyl ether esters (Esteron 245[1]), and 4-amino-3,5,6-Trichloropicolinic acid (picloram) plus 2,4,5-T (Tordon 225 Mixture[1]) applied either alone or in combination with 1, 5, 10, 50, or 10,000 (1%) ppm α-NAA. The herbicides were mixed according to the manufacturer's recommendations and applied with a compressed air garden sprayer. Basically, the Esteron 245 (4 lb A.E./gal) mixture consisted of 1 oz of herbicide dissolved in 1 oz of diesel fuel with water added to a volume of 1 gallon. One ounce of Veon 245 (4 lb A.E./gal) and 2 oz of Tordon 225 Mixture (2 lb A.E./gal) were dissolved in 1 gal of water. All mixtures were equivalent to 3 lb of herbicide per 100 gal of solution. A surfactant (Tronic[1]) was added to each herbicide solution to approximate 0.02% of the total volume. Each stump and the immediately surrounding area received a maximum of 0.1 gallon.

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[1] Use of trade names does not constitute endorsement by the authors or Texas Tech University. They are used for the convenience of the reader.

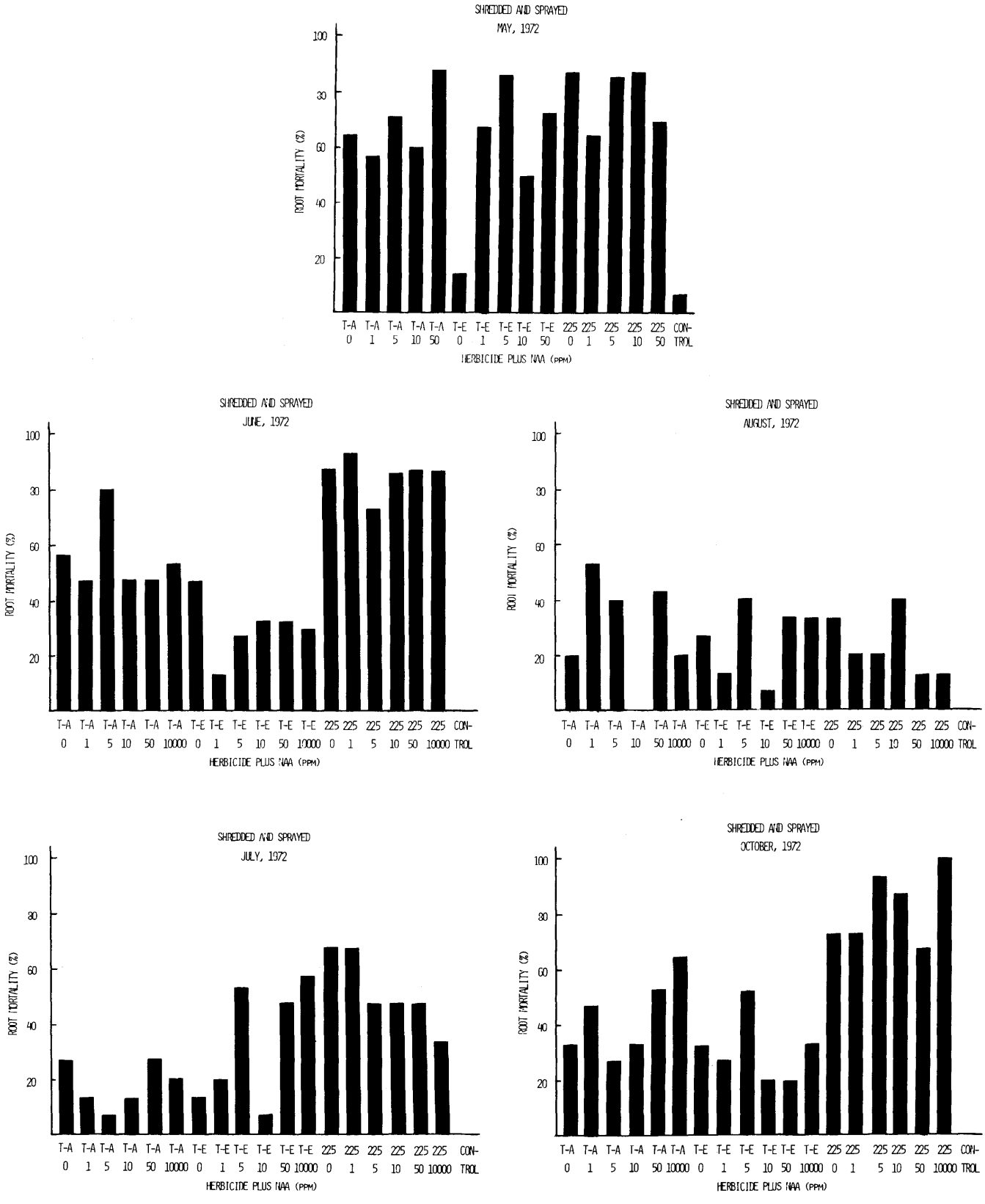

Fig. 1. *Average root mortality of honey mesquite shredded and sprayed with 2,4,5-T amine (T-A), 2,4,5-T ester (T-E), and Tordon 225 Mixture (225) plus NAA (0, 1, 5, 10, 50, and 10,000 ppm) at various times during 1972.*

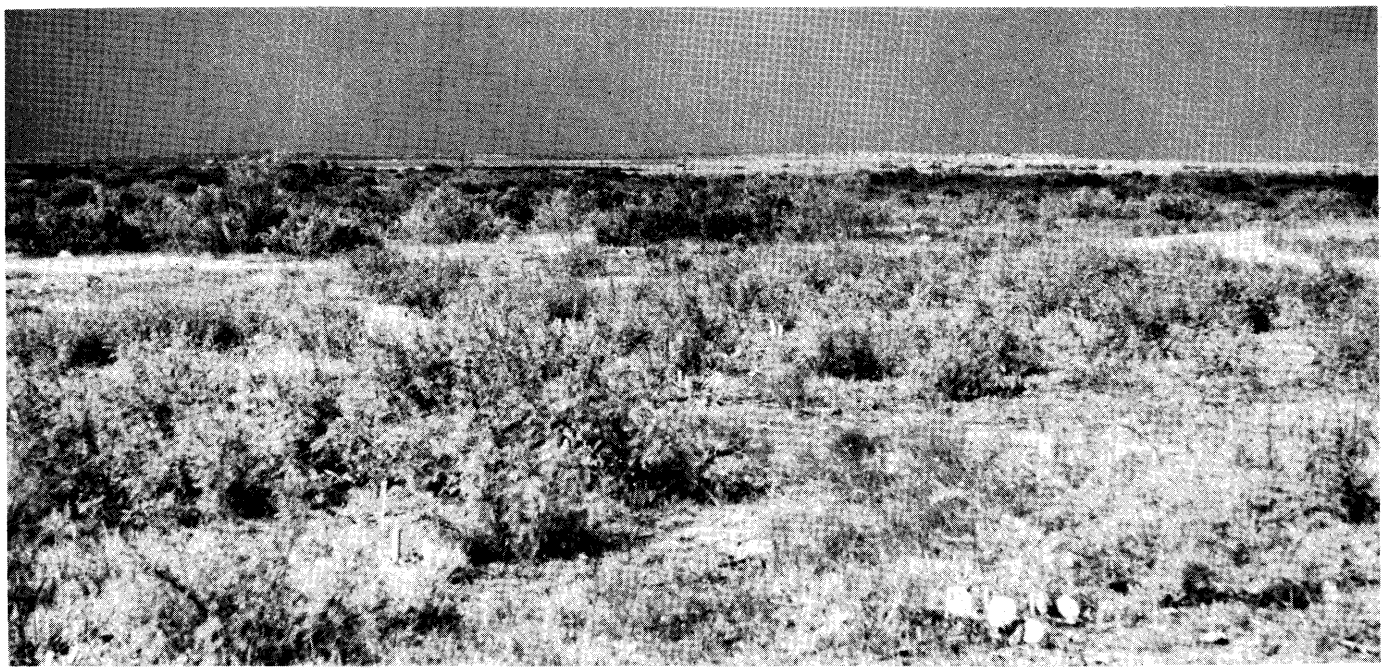

Fig. 2. *Resprouts from trees shredded May 15, 1972, but not sprayed (photo was taken June 13, 1972).*

Soil temperature, soil water content, air temperature, and relative humidity were measured at the time of herbicide application. Soil temperature was measured with a mercury-filled laboratory thermometer inserted into a 3/8-inch hole in the soil to depths of 6, 12, 18, and 24 inches. Soil water content (percent) was measured by gravimetric samples taken in 6-inch increments from the soil surface to a depth of 24 inches. Relative humidity was measured with a sling psychrometer. The stage of mesquite phenological development was evaluated at the time of shredding and spraying. Root mortality of stumps of trees shredded and sprayed in 1972 were evaluated in the fall of 1973. Any resprouting constituted live trees. The data were analyzed by chi-square analysis and statistical differences were denoted at the 95% confidence level.

Results and Discussion

Herbicides simultaneously applied with shredding have tremendous potential in the control of honey mesquite (Fig. 1). All herbicide treatments applied in May except 2,4,5-T ester (applied alone) resulted in much higher root mortality than was found in the control. This coincides with the results reported by Wright (1968). Herbicide solutions involving Tordon 225 Mixture when applied during June and October resulted in more than 80% root mortality and killed 40–70% of the trees treated in July. Trees shredded and sprayed with solutions of 2,4,5-T amine also had a large percentage (35 to 80%) root mortality in June and October. Goen and Dahl (unpublished data) also obtained good control from shredding and spraying mesquite in the fall.

Percentage root mortality obtained from 2,4,5-T ester solutions was generally lower than that obtained from the other herbicide solutions. However, 2,4,5-T ester plus 5, 50, or 10,000 ppm NAA resulted in total root kill of 50–60% of the trees treated in July. NAA (5 ppm) increased the effectiveness of 2,4,5-T ester (vs applied alone) during every month of application except June. NAA did not significantly increase the effectiveness of either 2,4,5-T amine or Tordon 225 Mixture.

Percentage root mortality obtained from shredding and spraying in August generally was lower than that obtained from treatments applied during the other months. However, the results from simultaneously shredding and spraying most often exceeded the average results (about 20 to 25% root mortality) one could expect to obtain from aerial spraying during a comparable period.

The live control trees were easily detected by their vigor and lush growth (Fig. 2). Only one control tree out of 75 marked was killed by shredding alone.

Root mortalities obtained from May and June treatments indicated that the trees were more easily killed by shredding and spraying because of their stage of phenological development. In May they had mature leaves and mostly white and yellow flowers (a few immature flower spikes were present). By June 15, a few flower spikes were blooming but the trees mainly possessed immature pods 1 to 6 inches long. Root carbohydrates had apparently been depleted to a minimum level through spring growth (Wilson, 1972). Wilson also found a decline in total available carbohydrates (TAC) in mesquite roots in late summer following rains in August. Kramer and Kozlowski (1960) reported that some tree species have a period of maximum root growth in May and June followed by a second peak of growth in the autumn. The soil water content had substantially increased in October (from an average 8.5% in the summer to 22% in October); thus resumption of root growth might account for the mortalities obtained from treatments during this period. The other environmental factors apparently did not significantly influence the effectiveness of any of the treatments applied in this study.

The effectiveness of herbicides applied with shredding to honey mesquite is somewhat difficult to explain since the chemical is not dependent upon foliar absorption with subsequent translocation to the basal bud zone. Since shredding removes the top growth, the herbicides must enter the plant some other way than foliar absorption. Leonard and Harvey (1965) reported that the effectiveness of chemical

Fig. 3. *Prototype shredder designed to spray the shredded stump and the area immediately surrounding the stump. Designed and built by Robert Koziol of Midland, Texas*

control may be increased by cutting into the stump near the base and immediately applying the herbicide. When phenoxy herbicides are applied to the base of the tree, they possibly penetrate the soil and envelop the bud zone and prevent subsequent sprouting (Ames, 1966).

Conclusions

Shredding honey mesquite without follow-up control is not a recommended practice. However, herbicidal application simultaneously with shredding can effectively increase mesquite control beyond the capabilities of either shredding or aerial spraying when applied alone. May is the best time to control mesquite by shredding and spraying and good results can be obtained from treatments applied in either June or October.

Herbicide mixtures of 3 lb of either 2,4,5-T amine, 2,4,5-T ester, or Tordon 225 Mixture per 100 gal of solution applied directly to the stump and its surrounding area effectively controlled resprouting in honey mesquite following shredding. The herbicide(s) from which the best results can be expected depends upon the month of application. However, Tordon 225 Mixture produced the greatest percentage root mortality consistently throughout the entire study.

Because a prototype shredder (Fig. 3) with the capability of spraying only the shredded stump and the immediately surrounding area has been developed, the method of shredding and spraying simultaneously has tremendous potential on large acreages of brush infested rangelands.

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